

WHAT IS CLAIMED IS:

1. A solid-state image pick-up device having a plurality of photoelectric converting devices arranged in a row direction and a column direction orthogonal thereto over a surface of a semiconductor substrate, comprising:

a vertical transfer section for transferring a charge from the photoelectric converting device in the column direction;

a horizontal transfer section for transferring a charge from the vertical transfer section in the row direction; and

an output section for outputting a signal corresponding to a charge transferred through the horizontal transfer section,

wherein the photoelectric converting device includes a plurality of high-sensitivity photoelectric converting devices arranged like a tetragonal grid in the row direction and the column direction orthogonal thereto and serving to carry out a photoelectric conversion having a relatively high sensitivity, and a plurality of low-sensitivity photoelectric converting devices arranged like the tetragonal grid in the row direction and the column direction orthogonal thereto and serving to carry out a photoelectric conversion having a relatively low sensitivity,

the high-sensitivity photoelectric converting device and the low-sensitivity photoelectric converting device are arranged at an equal array pitch in positions shifted by $1/2$ of the array pitch from each other in the row direction and the column direction,

the vertical transfer section includes a plurality of vertical transfer channels formed on the semiconductor substrate corresponding to the photoelectric converting devices provided in the column direction, a plurality of vertical transfer electrodes formed to cross each of the vertical transfer channels as seen on a plane, and a charge reading region for reading a charge of the photoelectric converting device onto the vertical transfer channels,

the vertical transfer channel takes a winding shape extended wholly in the column direction between the photoelectric converting devices,

the vertical transfer electrode takes a winding shape extended wholly in the row direction between the photoelectric converting devices, and

5 the charge reading regions of the photoelectric converting devices which are adjacent to each other in the column direction are formed between the vertical transfer channels which are different from each other.

2. The solid-state image pick-up device according to claim 1,
10 wherein four vertical transfer electrodes are provided corresponding to one photoelectric converting device and are driven by vertical transfer pulses having eight phases together with the four vertical transfer electrodes corresponding to other photoelectric converting devices which are adjacent to each other in the column direction.

15 3. The solid-state image pick-up device according to claim 1, wherein two vertical transfer electrodes are provided corresponding to one photoelectric converting device and are driven by vertical transfer pulses having four phases together with the two vertical transfer electrodes
20 corresponding to other photoelectric converting devices which are adjacent to each other in the column direction.

4. A solid-state image pick-up device having a plurality of photoelectric converting devices arranged in a row direction and a column
25 direction orthogonal thereto over a surface of a semiconductor substrate, comprising:

a vertical transfer section for transferring a charge from the photoelectric converting device in the column direction;

a horizontal transfer section for transferring a charge from the
30 vertical transfer section in the row direction; and

an output section for outputting a signal corresponding to a charge

transferred through the horizontal transfer section,

wherein the photoelectric converting device includes a plurality of high-sensitivity photoelectric converting devices arranged like a tetragonal grid in the row direction and the column direction orthogonal thereto and serving to carry out a photoelectric conversion having a relatively high sensitivity, and a plurality of low-sensitivity photoelectric converting devices arranged like the tetragonal grid in the row direction and the column direction orthogonal thereto and serving to carry out a photoelectric conversion having a relatively low sensitivity,

the high-sensitivity photoelectric converting device and the low-sensitivity photoelectric converting device are arranged at an equal array pitch in positions shifted by $1/2$ of the array pitch from each other in the row direction and the column direction,

the vertical transfer section includes a plurality of vertical transfer channels formed on the semiconductor substrate corresponding to the photoelectric converting devices provided in the column direction, a plurality of vertical transfer electrodes formed to cross each of the vertical transfer channels as seen on a plane, and a charge reading region for reading a charge of the photoelectric converting device onto the vertical transfer channels,

the vertical transfer channel takes such a shape as to connect two winding shapes extended wholly in the column direction between the photoelectric converting devices,

the vertical transfer electrode takes a winding shape extended wholly in the row direction between the photoelectric converting devices, and

the respective vertical transfer channels are shared for the transfer of the charges from the high-sensitivity photoelectric converting devices for one column and the transfer of the charges from the low-sensitivity photoelectric converting devices for one column which is adjacent thereto.